NOTES AND DESCRIPTIONS IN THE MEGACHILID SUBGENUS CHELOSTOMOIDES[1]

(Hymenoptera: Apoidea)

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Several collections of bees, mostly of the genus *Megachile*, have been submitted to the writer in recent years by a number of collectors and institutions in California, Arizona and other western states. Most of the included material has been determined and returned, but some of the data accumulated is worthy of note, and a number of apparently new species are in need of description. This paper will be limited to the western species of the subgenus *Chelostomoides* Robertson, but will include a revised key to all of the known species in the subgenus.

In so far as the habits are known, the species included in *Chelostomoides* are resin-working bees, rather than leaf-cutters in their nest building activities. The group includes some of the most highly specialized forms in the genus, and many of them are desert dwellers. Consequently, the subgenus *Chelostomoides* is well represented in the arid regions of the Southwest and in Mexico, and that area possibly is the center of origin for the group. It ranges east into the Atlantic Coast States, where the species are associated with a more mesic type of flora, and also extends south through Central America into the northern part of South America. Some of the species visit such crop plants as alfalfa, sweet clover and various other legumes, and they may have some importance as pollinators of some of these plants.

MEGACHILE (CHELOSTOMOIDES) CHILOPSIDIS Cockerell

The name originally proposed for this species, as a *Lithurgus*, was *oblongus*, not *longulus* as given in the Catalog of Hymenoptera, (Muesebeck, et al. 1951:1182). Cockerell (1900:17), described the same species as a *Megachile*, proposing the name *chilopsidis*. Later Fox (1902:137), discovering his error, assigned the species to *Megachile* and proposed *longula* to replace *oblonga* which was preoccupied in *Megachile*. Cockerell (1924:548) suggested that *chilopsidis* and *longula* could be synonymous, but apparently was not entirely convinced and continued to use both names. Finally

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this writer (Mitchell 1937:403) concluded that the synonomy was correct, but through error, failed to make the change of name called for by the circumstances. All of this applied solely to the female, the male being unrecognized until recently.

A further complication now arises with respect to the identity of the male. It seems probable that the male described by Cockerell (1913:541) as *pratti* belongs with *chilopsidis*. In the Catalog (Muesebeck, et al. 1951:1183) it is associated with *discorhina* Cockerell. What the writer believes to be the true male of *discorhina* is very similar to *pratti*, and it seems likely that the two have been confused. Differences between them, however, seem to be constant, even though rather obscure without careful examination. The chief differences are as follows:

discorhina: clypeus very flat, the pubescence entirely white.

pratti: clypeus slightly convex near upper margin, with a few inconspicuous black erect hairs scattered through the generally white facial pubescence.

Neither of these males bears much resemblance to the respective females and the association has been based in large part on collection data and flower records. Recently a long series of specimens of *longula* and a shorter one of *discorhina* were received from G. D. Butler at Tucson, and while the data from these is suggestive as to the proper association of the two sexes of each, it is not conclusive. Some careful observations at the collecting sites, or of mating or nesting activities, are needed to solve the problem. It is of some importance, for if *pratti* proves to be the male of *chilopsidis*, it becomes a synonym, and *discorhina* will be the correct name for the other species.

Females of *chilopsidis* have been collected at Blythe, San Felipe Valley and Indio, California, April and June, on *Acacia greggii, Melilotus* and alfalfa; at Las Cruces, New Mexico, May, on *Chilopsis linearis;* and at Walton, Tuscon, Yuma, Oracle, Phoenix, Papago Indian Reservation, Superior, Ray, Sabino Canyon, Apache, Buckeye, Glendale, Payson, Continental and Safford, Arizona, April–July, on *Acacia, Cercidium, Chilopsis linearis, Olneya tesota,* alfalfa and *Prosopis.*

Males *(pratti)* have been collected at Magnesia Canyon, California, April; and at Phoenix, Tucson, Ray, Catalina Mountains, Superior, Tasque Verde and Buckeye, Arizona, May and June, on *Cercidium, Acacia,* and *Prosopis juliflora.*

MEGACHILE (CHELOSTOMOIDES) DISCORHINA Cockerell

Females of *discorhina* have been collected at Cathedral City, Furnace Creek (Death Valley), Edom, Palm Springs and Indio, California, on *Larrea glutinosa*, *Cercidium torreyanum* and *Melilotus*; and at Oracle, Tucson, Yuma, Catalina Mountains, Ray, and at the Santa Rita Range Experiment Station, Arizona, April–June, on *Acacia*, *Prosopis*, *Cercidium* and *Larrea*. Males also were collected at Ray and at the Santa Rita Station.

MEGACHILE (CHELOSTOMOIDES) FELIPIANA Mitchell

A third female of this rarely collected species has been received from A. T. McClay at Davis, California. It bears the following data: Magnesia Canyon, Riverside County, California, July 2, 1952 (A. T. McClay). The type locality (Mitchell, 1937:405) is San Felipe Valley, San Diego County, and a second specimen was collected in the Santa Rita Mountains, Arizona (Mitchell, 1942: 118).

MEGACHILE (CHELOSTOMOIDES) ODONTOSTOMA Cockerell

(= *duplexa* Mitchell) new synonomy.

In the Revision of Megachile (Mitchell, 1937:411) it was suggested that *M. (C.) duplexa* Mitchell (1934:354) probably is the male of *odontostoma*. The collection by E. G. Linsley of *duplexa* (8♂♂) and *odontostoma* (5♀♀) together at Furnace Creek, Death Valley, April 8, 1939, on *Prosopis* would seem to indicate their common identity rather conclusively. This species has been collected also at Indio and Blythe, California, April and May, on *Prosopis* and *Melilotus*, and at Yuma, Payson, Superior, Tucson and Sycamore Canyon, Arizona, May and June, on *Acacia* and *Senecio longilobus*.

Following are additional locality and flower records for several western species of *Chelostomoides*:

M. (C.) angelarum Cockerell—Penticton, British Columbia, Aug.; Little Spokane, Washington, July; Continental Divide, New Mexico, July; Tuolumne County, Sierraville, San Jacinto Mountains, Mount Madonna, Whitney Portal, Antioch, Big Pine Creek, Mineral King, Snowline Camp (Eldorado County), Middletown, Mount St. Helena, Camino, Tiltill Valley, Calpine, Mount Diablo, Frog Creek, Quincy, Hobart Mills, Arroyo Seco, Glacier Point, St. Rosa Mountain, Keen Camp Summit, Baxter, May—Aug., and Nov. on *Lotus davidsonii, L. rigidus, L. oblongifolius, Astragalus, Cryptantha, Phacelia, Trichostema laxum, Centurea solstitialis, Lupinus, Agastache, Solidago* and *Cirsium*.

M. (C.) subexilis Cockerell—San Francisco Mountains, Catalina Mountains, Chiricahua Mountains, and Marion, Arizona, June, July, August, Octo-

ber; Logan, Utah, June; on *Salvia lemmoni, Phacelia, Vicia villosa, Lotus rigidus*, sweet pea, and red clover.

M. (C.) davidsoni Cockerell—Idyllwild, Keen Camp, Arroyo Seco, San Bernardino Mountains, California, June, on *Dicentra chrysantha* and *Pentstemon.*

M. (C.) occidentalis Fox—Loving and Las Cruces, New Mexico, May; Stockton Pass, Pinalena Mountains, Payson, Safford, Superior, Tucson, Yuma and Sedonia, Arizona, June and July; and Palm Canyon, Borego, Palm Springs, Blythe, Ripley and Piñon Flat, California, April–October, on *Lotus rigidus, Cercidium*, alfalfa, *Tamarix gallica, Nolina parryi, Chilopsis linearis*, and pepper tree. At Blythe it was found nesting in an adobe wall (Linsley).

M. (C.) lobatifrons Cockerell—Tucson and Grand Canyon, Arizona, June; and Victorville, Big Pine, Lone Pine, Blythe, Olancha, Tehachapi and Shavers Well, California, May–August, on *Cercidium* and *Prosopis pubescens.*

M. (C.) spinotulata Mitchell—Catalina Mountains, Oak Creek Canyon, and Sedonia, Arizona, May–August; Pecos, Texas, June; Stein, New Mexico, August; and Big Pine Creek, Jacumba, Camp Baldy, Big Rock Canyon, Piñon Flat, Olancha, Stone Creek, Hemet Reservoir and Herkey Creek, California, May–September, on *Eriogonum, Cryptantha, Robinia and Eriodictyon angustifolia.*

M. (C.) subspinotulata Mitchell—Catalina Mountains, Arizona, May 8, 1954 (Butler).

Megachile (Chelostomoides) texensis Mitchell, new species

Female.—Size: length 11 mm.; width of abdomen 3 mm.; anterior wing 7 mm. *Structure:* Length of face slightly less than distance between eyes; eyes very slightly divergent below; supraclypeal area protuberant; clypeus very short and broad, with a conical median protuberance which is about level with the supraclypeal area, apical margin broadly incurved, with a pair of strong spinelike tubercles on each side of mid line; mandibles narrow and elongate apically, with four low but quite distinct teeth, inner margin with a low subbasal tooth; first and second segments of flagellum very short, much broader than long, and the two combined only slightly exceeding the pedicel, following segments slightly longer than broad; lateral ocelli subequally distant from eyes and margin of vertex; cheeks subequal to eyes in width; metatarsi rather narrow, much shorter than tibiae, subequal in length to the following segments combined; second to fourth abdominal terga with rather deep carinate basal grooves, the sixth not appreciably grooved apically. *Sculpture:* Face and clypeus rather coarsely rugoso-punctate, the punctures becoming somewhat more distinct on vertex posteriorly and becoming finer and more distinctly separated on cheeks, but becoming crowded below; distinctly separated but irregular and rather close over the shining mesonotum and scutellum, rather close and shallow but distinctly separated on pleura above, becoming quite sparse below; rather fine, irregularly scattered and quite widely separated on abdominal terga 1–4, becoming finer and quite close on the fifth, those on the sixth obscured by dense tomentum. *Color:* Black; wings faintly infuscated, veins and stigma piceous; tegulae brownish-testaceous; flagella brownish-piceous beneath, blackish

above; mandibles black, becoming somewhat reddened apically; legs black, spurs reddish-testaceous. *Pubescence:* White in general on head, thorax and legs but with elongate erect dark hairs scattered over vertex, face, clypeus and dorsum of thorax; white and rather elongate over basal abdominal tergum, discs of the following segments with extremely short and obscure pubescence which is black on 2–5, terga 1–5 with entire white rather narrow apical fasciae, the sixth densely covered with whitish tomentum and with short erect black hairs in addition; scopa rather short, yellowish white, black on sixth sternum.

Holotype, female, SOUTHMOST, CAMERON COUNTY, TEXAS, April 13, 1950. (Beamer, Stephen, Michener and Rozens, on *Parkinsonia.*) [Univ. Calif.]

Megachile (Chelostomoides) tucsonensis Mitchell, new species

Female.—Size: length 13 mm.; breadth of abdomen 3.5 mm.; anterior wing 9 mm. *Structure:* Length of face slightly less than distance between eyes; eyes slightly divergent below; clypeus flat, about four times broader than long, apical margin with a pair of rounded and rather deep emarginations on each side of a median slight projection; mandibles narrow and elongate, dentate margin with a low and rather indefinite subapical tooth, otherwise teeth very poorly defined; basal segment of flagellum slightly longer than broad, shorter than pedicel, second slightly longer, the following segments considerably longer than broad; distance between lateral ocelli and eyes much shorter than that between ocelli and margin of vertex; cheeks subequal to eyes in width; metatarsi narrow and elongate, shorter than the respective tibiae but somewhat longer than the following segments combined; abdominal terga 2–4 with quite deep basal carinate grooves, the sixth with a subapical groove or excavation. *Sculpture:* Punctures quite coarse, deep and close over most of face and clypeus, becoming fine on vertex posteriorly and cheeks above, but very coarse, deep and close on cheeks below; coarse, deep and rather close but somewhat irregular on mesonotum and scutellum; rugoso-punctate on pleura above and anteriorly, becoming more distinct, deep and well separated posteriorly and below; close, coarse and deep on abdominal terga basally, becoming more sparse to the fourth tergum apically, those on the fifth somewhat closer, those on the sixth very fine and almost crowded. *Color:* Black; wings subhyaline, veins and stigma piceous to blackish; tegulae testaceous; antennae, mandibles and legs entirely black; spurs pale testaceous. *Pubescence:* White in general and quite short on head, thorax and legs, becoming quite dense between antennae and eyes, on pleura and propodeum, and narrowly along lateral margins of mesonotum; abdominal terga 1–4 with entire but rather narrow white apical fasciae, 2–3 white fasciate also in the basal grooves, the fifth not fasciate except at extreme sides, and the sixth with a basal transverse patch of white tomentum, pubescence of the discs very short and inconspicuous, but with evident erect blackish hairs on the fifth and sixth apically; scopa white and rather short, very short and black on the sixth sternum.

Holotype, female, TUCSON, ARIZONA, September 20, 1947 (Ross M. Ellen). [Univ. Ariz.]

Following is a revised key to the nearctic and neotropical species of *Chelostomoides*.

Females:

1. Clypeus much modified, either produced, excavated, lobed, angulate, or with deep and conspicuous apical emarginations; mandibles often slender and elongate 2

   Clypeus flattened, not much modified, at most with the apical margin denticulate, or with shallow, inconspicuous emarginations; mandibles broad apically, 4- or 5-dentate 14

2. Mandible strongly protuberant at base above 3
   Mandible not or only very slightly protuberant above 5

3. Clypeus consisting of two prominent triangular acute lobes projecting forward at right angles to the face ..... *davidsoni* Cockerell
   Clypeus with lateral rounded lobes and a more or less definite median lobe 4

4. Median clypeal lobe subequal to the lateral lobes; basal protuberance of mandible relatively small ..... *ignacensis* Mitchell
   Median clypeal lobe much broader than the lateral lobes; basal mandibular protuberance broad and inconspicuous ..... *lobatifrons Cockerell*

5. Apical dentate margin of mandible broad, nearly or quite equal to inner margin (from inner angle to base) 6
   Mandibles slender and elongate, the dentate margin very short, usually 3-dentate, sometimes with a low angle or tooth on the inner margin 8

6. Clypeus flat, the margin prominently angled at each side, and with a pair of strong submedian tubercles, forming a median and a pair of lateral deep emarginations ..... *subexilis* Cockerell
   Clypeus protuberant, or without the median emargination 7

7. Clypeal margin conspicuously 3-lobed, forming a pair of deep rounded emarginations ..... *occidentalis* Fox
   Clypeus transverse, with a short but very broad, closely punctate upper face and a slightly shorter shining lower face, the margin nearly straight ..... *manni* Mitchell

8. Clypeal margin with a pair of prominent acute projections delimiting a deep median emargination, the upper face slightly protuberant medially ..... *odontostoma* Cockerell
   Clypeus otherwise modified 9

9. Clypeus flat, very broad and rather short, with a pair of broad and rather deep emarginations on each side of a very shallow median emarginate area ..... *tucsonensis* new species
   Clypeus either protuberant, angled or otherwise modified, but not flattened 10

10. Median area of clypeus oblique, the upper margin slightly elevated,

shining below and with a few shallow punctures above, a small protuberance on each side ..... *rugifrons* Smith

Clypeus or supraclypeal area strongly protuberant 11

11. Clypeus consisting of a narrow bowed projection just beneath antennae, the surface below oblique, broad, impunctate and polished ..... *discorhina* Cockerell

Clypeal protuberance formed otherwise 12

12. Supraclypeal area strongly protuberant, upper margin of clypeus somewhat less so, apical margin with a deep rounded median emargination ..... *felipiana* Mitchell

Clypeus more strongly protuberant, without a deep median emargination 13

13. Clypeus with an acute median protuberance, the margin broadly incurved and with a pair of small submedian tubercles ..... *texensis* new species

Clypeus medially and supraclypeal area strongly and evenly elevated, lateral portions of clypeus depressed below this level and with a lower polished and imputate face at right angles to elevated area ..... *chilopsidis* Cockerell

14. Clypeal margin entire, neither denticulate nor emarginate 15

Clypeal margin either denticulate or slightly emarginate 16

15. Clypeal margin straight from side to side, (nearctic) ..... *georgica* Cresson

Clypeal margin broadly triangular, having an obscure median angle (neotropical) ..... *peruviana* Smith

16. Mandible distinctly 5-dentate: sixth tergum with a deep subapical groove ..... *spinotulata* Mitchell

Mandible 4-dentate; or indistinctly 5-dentate, but without a groove near apex of sixth tergum 17

17. Clypeal margin with at least a slight median denticle 18

Clypeal margin lacking a median denticle, but with a distinct median emargination 22

18. Abdominal terga 4–6 covered with dense fulvous tomentum; clypeus with a narrow median raised line (neotropical) ..... *otomita* Cresson

At least the fourth tergum lacking dense tomentum other than the apical fascia; clypeus without a median raised line 19

19. Clypeal margin with five nearly equal and evenly spaced denticles, mandible distinctly 4-dentate, sixth abdominal tergum with dense white tomentum obscuring the surface (neotropical) ..... *haematoxylonae* Mitchell

Clypeal margin not as above 20

20. Clypeus with numerous erect and rather long black hairs interspersed among the shorter subappressed white hairs: mandible obscurely 5-dentate (neotropical) ..... *abacula* Cresson

Pubescence of clypeus entirely white 21

21. Clypeal margin with a shallow and narrow median emargination, this with a small median denticle; fifth abdominal tergum white fasciate apically ..... *exilis* Cresson
Clypeal margin with a shallow but very broad median emargination, in the center of which is a strong tubercle; fifth tergum not fasciate ..... *subspinotulata* Mitchell

22. Fifth abdominal tergum white fasciate apically; western ..... *angelarum* Cockerell
Fifth tergum not fasciate; eastern 23

23. Pubescence of sixth abdominal tergum entirely pale; wings only lightly infuscated ..... *campanulae campanulae* Robertson
Sixth tergum with short erect black hairs in addition to the whitish tomentum; wings quite deeply infuscated ..... *campanulae wilmingtoni* Mitchell

Males

1. Mandible without an inferior tooth or projection 2
Mandible with a distinct basal or submedian tooth or protuberance beneath 10

2. Carina of sixth tergum narrow and protuberant, the apex emarginate ..... *lobatifrons* Cockerell
Carina of sixth tergum either bidentate or very low and with but a slight median emargination 3

3. Clypeal margin tuberculate or denticulate 4
Clypeal margin entire medially 6

4. Clypeus with conspicuous erect black hairs interspersed in the generally white and dense pubescence; abdominal terga 4–5 covered with dense fulvous tomentum (neotropical) ..... *abacula* Cresson
Clypeus with but very few and inconspicuous black hairs or none; abdominal terga 4–5 not densely tomentose 5

5. Clypeal margin with a single robust median tubercle (neotropical) ..... *peruviana* Smith
Clypeal margin with a pair of rather robust tubercles and between them a relatively slight median denticle ..... *manni* Mitchell

6. Carina of sixth tergum conspicuously bidentate 7
Carina of sixth tergum very low and inconspicuous, with at most a barely evident emargination 8

7. Clypeus quite flat, even above, and with entirely white pubescence ..... *discorhina* Cockerell
Clypeus somewhat convex above, and with a few inconspicuous black hairs scattered among the generally white hairs ..... *chilopsidis* Cockerell

8. Punctures of vertex very coarse, much more so than those of mesonotum; lateral ocelli nearer to eyes than to margin of vertex

.....*rugifrons* Smith

Punctures of vertex about equal to those of mesonotum; lateral ocelli subequally distant from eyes and margin of vertex..... 9

9. Clypeal margin with quite deep lateral emarginations, the median area straight but the center somewhat impressed; segment 2 of flagellum about four times the length of segment 1, and equal to the following segments.....*browni* Mitchell

Clypeal margin with low subequal median and lateral emarginations; segment 2 of flagellum shorter than 3, and about three times the length of segment 1.....*odontostoma* Cockerell

10. Front tarsi concolorous with their tibiae and femora, only slightly dilated and lower surface little if any excavated..... 11

Front tarsi modified, more or less widely dilated and flattened, contrasting with their tibiae in color, and often deeply excavated beneath 15

11. Discs of abdominal terga 4–5 well covered with short erect black pubescence, but this not hiding the surface.....*angelarum* Cockerell

Pubescence of terga 4–5 entirely pale..... 12

12. Fourth abdominal tergum rather sparsely punctate, interspaces considerably exceeding diameter of punctures (neotropical) .....*cartagenensis* Mitchell

Fourth tergum more closely punctate, interspaces not exceeding diameter of punctures..... 13

13. Front coxae with very short but relatively distinct spines; punctures of vertex and mesonotum about equal.....*subexilis* Cockerell

Front coxal spines reduced to dentiform tubercles; punctures of vertex somewhat coarser than those of mesonotum..... 14

14. Wings lightly infuscated; punctures of vertex only slightly more coarse than those of mesonotum.....*campanulae campanulae* Robertson

Wings more deeply infuscated; punctures of vertex much more coarse than those of mesonotum.....*campanulae wilmingtoni* Mitchell

15. Front metatarsi rather widely dilated and flattened, but not at all excavated beneath 16

Front metatarsi more or less deeply excavated beneath..... 18

16. Apical segment of front tarsus much longer than the metatarsus (ratio of 3:2).....*davidsoni* Cockerell

Apical segment of front tarsus no more than equal in length to the metatarsus 17

17. Apical segment of front tarsus about equal in length to the metatarsus .....*occidentalis* Fox

Apical segment of front tarsus about half the length of the metatarsus .....*georgica* Cresson

18. Front coxal spines well developed..... 19

Coxal spines reduced to obscure dentiform tubercles..... 20

19. Front coxal spines long and slender, discs of abdominal terga 4–6 not tomentose.....*spinotulata* Mitchell
Front coxal spines short, acute, subtriangular; abdominal terga 4–6 entirely covered with fulvous tomentum (neotropical).....*otomita* Cresson

20. Third segment of front tarsus narrower than the second segment, and becoming still narrower apically.....*exilis exilis* Cresson
Third segment of front tarsus about as broad as the second segment, truncate apically.....*exilis parexilis* Mitchell

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Book Review

THE BEETLES OF THE PACIFIC NORTHWEST. PART I: INTRODUCTION AND ADEPHAGA. By Melville H. Hatch. University of Washington Publications in Biology, Vol. 16, pp. 1–340. Paperbound, offset. Published December 20, 1953. Price $5.00, from the Univ. Wash. Press, Seattle 5.

"If only this had been available when I was a beginner!", is the reaction of most West Coast coleopterists to Dr. Hatch's first volume. The series is equally welcome now, and will be an invaluable source and stimulus for those just broaching our hobby.

This is a work[1] on the beetle fauna of British Columbia, Washington, Idaho, and Oregon; it is a text for identifying to species, and in many

[1] Volume II has been completed and will appear soon.